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IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF	:	
JEAN-MARC SUAU, ET AL.	:	EXAMINER: BERNSHTEYN, M.
SERIAL NO: 10/522,340	:	
FILED: AUGUST 12, 2005	:	GROUP ART UNIT: 1713
FOR: METHOD FOR THE CONTROLLED RADICAL POLYMERISATION OF ACRYLIC ACID AND THE SALTS THEREOF, POLYMERS THUS OBTAINED AND APPLICATIONS THEREOF	:	

APPEAL BRIEF

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

SIR:

This is an appeal from the Office Action dated February 28, 2008, of Claims 1 and 3-8. A Notice of Appeal was filed on May 28, 2008.

I. REAL PARTY IN INTEREST

The real party in interest is Coatex S.A.S. of Genay, France, by virtue of the assignment recorded August 12, 2005, at Reel/Frame 016887/0894.

II. RELATED APPEALS AND INTERFERENCES

Appellants, Appellants' legal representative and their assignee are not aware of any other appeals or interferences which will directly affect or be directly affected by or having a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS

The appealed claims are Claims 1 and 3-8. Claims 1 and 3-8 stand rejected. Claim 8 also stand objected to.

The status of Claims 1 and 3-8 is "previously presented". The status of Claims 2 and 9-24 is "canceled".

IV. STATUS OF AMENDMENTS

No Amendment was filed in response to the Office Action of February 28, 2008.

V. SUMMARY OF CLAIMED SUBJECT MATTER

As claimed in **Claim 1**, the present application relates to a process for controlled radical homopolymerization, in an aqueous solution, of acrylic acid and its salts, or of copolymerization, in aqueous solution, of acrylic acid with one or more hydrosoluble monomers, wherein said process is in batch or semi-batch mode, and wherein said process comprises two stages, the first of which is synthesizing "in situ" an hydrosoluble transfer agent used in the second stage of polymerization;

wherein the reactive media of the first stage of synthesis of the transfer agent and of the second stage of polymerization are identical and solely water.

See for example, page 1, lines 7-8, page 5, lines 12-18, and page 7, last paragraph, of the specification.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

(A) Claims 1 and 3-8 stand rejected as being obvious under 35 U.S.C. §103 (a) over Chiefair et al (WO 99/31144) in view of John T Lai (Macromolecules 2002, vol. 35, No. 18, p. 6754-6756).

(B) Claim 8 stands rejected under 35 U.S.C. § 112, 2nd paragraph.

(C) Claim 8 stands objected to because of improper Markush format.

VII. ARGUMENT

Ground (A)

Claims 1 and 3-8 stand rejected as being obvious under 35 U.S.C. §103 (a) over Chiefair et al (WO 99/31144) in view of John T Lai (Macromolecules 2002, vol. 35, No. 18, p. 6754-6756). That rejection is untenable and should not be sustained.

The present invention as set forth in **Claim 1** relates to a process for controlled radical homopolymerization, in an aqueous solution, of acrylic acid and its salts, or of copolymerization, in aqueous solution, of acrylic acid with one or more hydrosoluble monomers, wherein said process is in batch or semi-batch mode, and **wherein said process comprises two stages, the first of which is synthesizing "in situ" an hydrosoluble transfer agent used in the second stage of polymerization;**

wherein the reactive media of the first stage of synthesis of the transfer agent and of the second stage of polymerization are identical and solely water.

Claims 3-8 are dependent claims.

The Examiner has not made a proper *prima facie* case of obviousness. Most notably, the Examiner has not shown a process which comprises two stages, the first of which is synthesizing "in situ" an hydrosoluble transfer agent used in the second stage of polymerization; wherein the reactive media of the first stage of synthesis of the transfer agent and of the second stage of polymerization are identical and solely water. Since there is no proper *prima facie* case, the rejection over Chiefair et al and John T Lai should be withdrawn.

Chiefair et al and John T Lai fail to disclose or suggest the combination of at least the following limitations:

1) "in situ" synthesis of a hydrosoluble transfer agent;
2) the use of the same solvent in the first and second stage
3) the use of water only as reaction medium in the first and second stage
4) the synthesis of a hydrosoluble transfer agent.

None of Chiefair et al and John T Lai disclose or suggest synthesizing "in situ" of the hydrosoluble transfer agent.

The phrase "in situ" is defined at page 5, lines 20-23 of the specification: "This "in situ" synthesis of the catalyser means that it does not to have to be handled as such, even if it can be advantageous to remove the residue from the synthesis of the transfer agent which is potassium or sodium bromide."

The "in situ" reaction is further illustrated by the Examples of the specification. See page 12 and following of the specification. Here, the catalyst is synthesized and then polymerizable monomer is added to the reaction solution containing the catalyst.

Each of Chiefair et al and John T Lai isolate a catalyst before using it for a polymerization. However, this means that there is no in-situ reaction, as claimed.

The Examiner refers to page 7, lines 23-25, page 26 lines 20-22, examples page 34-64 of Chiefair et al. See the Office Action of February 28, 2008 at page 4, second paragraph. However, those passages only mention the batch and the semi batch modes of the process.

None of Chiefair et al and John T Lai disclose or suggest to use the same reaction medium in the first and second stage.

Chiefair et al (WO 99/31144) is discussed in the specification at page 2, lines 23-38: "Other documents (**WO 99/31144**; WO 00/75207; WO 01/27176; WO01/42312; WO 02/08307; WO 02/22688) **require the use of a reactive medium for synthesis of the transfer agent other than water**. These transfer agents synthesised in a solvent medium other than water do not allow acrylic acid to be polymerised in the same reactive medium as that which allowed synthesis of the transfer agent." Emphasis added.

Further, none of Chiefair et al and John T Lai disclose or suggest to use only water as a reaction medium in the first and second stage.

The Examiner has acknowledged that Chiefair et al does not disclose that the reactive media of the first and second reaction stage are water only. See page 6, lines 5 and 4 from the bottom, of the Office Action of February 28, 2008. Applicants agree. In fact that all the

previously recited passages at page 4, 2nd paragraph of the Office Action of September 19, 2007, **DO NOT MENTION WATER AS THE SOLE SOLVENT** but, at the contrary, **ARE DISCLOSING THE USE OF ORGANIC SOLVENTS** :

- in procedure 1, page 35, the solvent is absolute ethanol (see line 31) water being added for the solvent extraction (lines 31-33) after the synthesis (see "the resulting mixture was stirred 3 hours", see line 32),
- at page 36 line 10, the solvent is dimethyl sulfoxide (DMSO) for the synthesis (see "the mixture was allowed to stir during 5 hours"), water being added for the extraction (lines 13-14) after the synthesis,
- ethanol is used in example 10 (the synthesis operates during "16 hours" see line 13),
- in example 11, water is first used ("mixture is stirred for 15 minutes" lines 25-26) but phenyl thiochloroformate (line 26) is added for the longest period of the synthesis ("the solution is stirred for 2 hours", see line 27).

These data are clearly attesting that chain transfer agents according to Chiefair et al are manufactured in the presence of **organic solvents** and not water as the sole solvent

John T Lai does not use the same solvent for making the transfer agent and for polymerization. There is no in-situ synthesis of the transfer agent.

John T Lai only mentions various solvents that may be suitable for polymerization. See page 6754, 2nd column, 2nd full paragraph. However, for the synthesis of the chain transfer agent, John T Lai uses a mixture of **chloroform and acetone**. See page 6754, 1st column, last paragraph and 2nd column, first paragraph. As such, John T Lai teaches away from using water only for the synthesis of the chain transfer agent.

Further, the Examples of John T Lai clearly show that a variety of solvents are used in the synthesis of the transfer agent and not solely water as claimed in the present invention. The only example in Table 1 at page 6755 of John T Lai that uses water in the polymerization uses catalyst 1 (S,S'-bis(α, α'-dimethylacetic acid) trithiocarbonate). The synthesis of catalyst 1 is described at page 6755, 1st column, at the bottom. However, chloroform and acetone are used to synthesize the catalyst. Thus, different solvents are used for the synthesis of the catalyst and the polymerization. In addition, the catalyst is isolated before using for the polymerization. Thus, there is no in-situ synthesis.

In John T Lai, there is no disclosure or suggestion of a process which comprises two stages, the first of which is synthesizing "in situ" an hydrosoluble transfer agent used in the second stage of polymerization; wherein the reactive media of the first stage of synthesis of the transfer agent and of the second stage of polymerization are identical and solely water. Thus, John T Lai does not cure the defects of Chiefair et al.

Further, contrary to the Examiner's statement (see the Office Action of February 28, 2008, at page 4, second paragraph), the chain transfer agents of Chiefair et al are **not water soluble**.

Chiefair et al uses additional solvent (procedure I, example 1 : methanol - procedure I example 2 : dimethyl sulfoxide - etc...). Indeed, Chiefair et al need a solvent because the chain transfer agents of Chiefair et al are not water soluble.

Contrary to the Examiner's statement, the chain transfer agents of Chiefair et al are not substantially identical to the claimed invention.

The chain transfer agents according to the present invention are hydrosoluble, and the chain transfer agents of Chiefair et al are not water soluble. One of the challenges of the

present invention was to find a process (in situ synthesis of the chain transfer agent + synthesis of the final polymer) in aqueous solution: it was not obvious to find a chain transfer agent which was hydrosoluble on one hand, and being able to control the polymerization of acrylic acid in water on other hand.

Chiefair et al does not disclose or suggest chain transfer agents that are water soluble and that can be made in the sole presence of water.

The following Table shows, for each chain transfer agent (CTA) manufactured in Chiefair et al: the name of the CTA, the corresponding reference number of the compound, the solvent used, and remarks if applicable. The reference numbers are the numbers of the compounds at pages 34, 35, 39 and 42 of Chiefair et al.

name of the chain transfer agent (CTA) of Chiefair et al	Reference number of compound of Chiefair et al (see pages 34, 35, 39, 42 of Chiefair et al)	solvent(s) used	remarks
benzyl 1-(2-pyrrolidinone)carbodithioate	61	ethanol	water is added in a second step, not for the synthesis of the catalyst but for the extraction process
benzyl 1-(2-benzenedicarboximido)carbodithioate	62	benzyl chloride	
2-cyanoprop-2-yl 1-pyrrolecarbodithioate	63	ethyl acetate	
2-cyanobut-2-yl 1-pyrrolecarbodithioate	64	ethyl acetate	
benzyl 1-imidazolecarbodithioate	65	dichloromethane	according to a different procedure than the one used for reference 64
N,N-dimethyl-S-(2-cyanoprop-2-yl) dithiocarbamate	66	benzene	
N,N-diethyl S-benzyl dithiocarbamate	67	THF	according to a different procedure than the one used for reference 66
cyanomethyl 1-(2-pyrrolidone)carbodithioate	68	acetonitrile	
N,N-diethyl S-(2-ethoxycarbonylprop-2-yl) dithiocarbamate	69	acetone ethanol	according to the protocol as disclosed in reference Eur. Polym. J 31, 67-68, 1995 (mentioned in Chiefair et al)
O-ethyl S-(1-phenylethyl) xanthate	70	ethanol	according to a different procedure than the one used for reference 69
O-ethyl S-(2-(ethoxycarrbonyl)prop-2-yl) xanthate	71	ethanol	
O-ethyl S-(2-cyanoprop-2-yl) xanthate	72	ethanol	
O-ethyl S-(2-cyanoprop-2-yl) xanthate	72	ethyl acetate	
O-ethyl S-cyanomethyl xanthate	73	ethanol	In contrast to compound 72, compound 73 is obtained from O-ethyl xanthogen sulfide, water is used for dilution
O-phenyl S-benzyl xanthate	74	diethyl ether	
O-pentafluorophenyl S-benzyl xanthate	75	CHCl3	
3-benzylthio-5,5-dimethylcyclohex-2-ene-1-thione	30	piperidine benzene DME DMF	
benzyl 3,3-di(benzylthio)prop-2-enedithioate	76	THF	

None of the 18 CTA's manufactured in Chiefair et al has been synthesized in the presence of only water; other organic solvent(s) is still present.

Thus, there is no water soluble chain transfer agent in Chiefair et al. Further, there is not even the slightest suggestion in Chiefair et al of a water soluble chain transfer agent.

Chiefair et al did NOT succeed in identifying a water soluble chain transfer agent and did not succeed in making a chain transfer agent in the sole presence of water.

Since all the chain transfer agents of Chiefair et al are made in organic solvents there is no expectation of success in using water only.

Thus, the claimed hydrosoluble chain transfer agent differs from the ones disclosed in Chiefair et al, which are not water soluble and which cannot be manufactured in the sole presence of water, as claimed in Claim 1 of the present invention.

Claim 3:

Claim 3 is separately patentable because Chiefair et al and John T Lai, alone or in combination, fail to disclose or suggest that the process is a process of controlled radical homopolymerization, in an aqueous solution, of acrylic acid, and is undertaken in batch mode.

Claim 4:

Claim 4 is separately patentable because Chiefair et al and John T Lai, alone or in combination, fail to disclose or suggest that the hydrosoluble transfer agent is an α-substitute β-carboxylate xanthate salt.

Claim 5:

Claim 5 is separately patentable because Chiefair et al and John T Lai, alone or in combination, fail to disclose or suggest that in the second stage of polymerization, the limits of quantity of transfer agent are determined, such that the molar ratio of transfer agent to monomer is between 0.001% and 20%, and the mass ratio of transfer agent to monomer is between 0.01% and 60%.

Claim 6:

Claim 6 is separately patentable because Chiefair et al and John T Lai, alone or in combination, fail to disclose or suggest that said process consists in putting in contact in the first stage:

- a potassium xanthate,
- 2-bromopropionic acid sodium salt,
- water,

and then in adding, in the second stage, acrylic acid and at least one hydrosoluble initiator of free radicals.

Claim 7:

Claim 7 is separately patentable because Chiefair et al and John T Lai, alone or in combination, fail to disclose or suggest that the first stage is undertaken with equimolar quantities of potassium xanthate and the sodium salt of 2-bromopropionic acid.

Claim 8:

Claim 8 is separately patentable because Chiefair et al and John T Lai, alone or in combination, fail to disclose or suggest that the hydrosoluble copolymerized monomers are selected from the group consisting of methacrylic acid, itaconic acid, maleic acid, 2-

acrylamido-2-methyl-1-propane sulphonic acid in acid form or partially neutralized, 2-methacrylamido-2-methyl-1-propane sulphonic acid in acid form or partially neutralized, 3-methacrylamido-2-hydroxy-1-propane sulphonic acid in acid form or partially neutralized, allylsulphonic acid, methallylsulphonic acid, allyloxybenzene sulphonic acid, methallyloxybenzene sulphonic acid, 2-hydroxy-3-(2-propenyloxy)propane sulphonic acid, 2-methyl-2-propene-1-sulphonic acid, ethylene sulphonic acid, propene sulphonic acid, 2-methyl sulphonic acid, styrene sulphonic acid, as well as all their salts, vinyl sulphonic acid, sodium methallylsulfonate, sulfopropyl acrylate or methacrylate, sulfomethylacrylamide, sulfomethylmethacrylamide, acrylamide, methylacrylamide, n-methylolacrylamide, n-acryloylmorpholine, ethylene glycol methacrylate, ethylene glycol acrylate, propylene glycol methacrylate, propylene glycol acrylate, propene phosphonic acid, ethylene or propylene glycol acrylate or methacrylate phosphate, vinylpyrrolidone, methacrylamido propyl trimethyl ammonium chloride or sulphate, trimethyl ammonium ethyl chloride or sulphate methacrylate, as well as their acrylate or acrylamide counterparts, whether quaternised or not, ammonium dimethyldiallylchloride, and mixtures thereof.

Thus, Claims 1 and 3-8 are Not Obvious over Chiefair et al (WO 99/31144) in view of John T Lai (Macromolecules 2002, vol. 35, No. 18, p. 6754-6756) within the meaning of 35 U.S.C. §103(a). For all the above reasons, it is respectfully requested that this rejection be REVERSED.

Ground (B)

Claim 8 stands rejected as under 35 U.S.C. § 112, 2nd paragraph. That rejection is untenable and should not be sustained.

Claim 8 sets forth proper Markush language in the form of "the hydrosoluble copolymerized monomers are selected from the group consisting of methacrylic acid, ... ammonium dimethyldiallylchloride, and mixtures thereof". Thus, Claim 8 is definite.

Regarding the element "sulphate methacrylate, as well as their acrylate or acrylamide counterparts, whether quaternised or not", a person of ordinary skill in the art would recognize that methacrylate can be replaced by acrylate or acrylamide. In addition, a person of ordinary skill in the art would recognize that the amide function of the acrylamide may be quaternized or not. Thus, Claim 8 is definite.

Thus, the rejection of Claim 8 under 35 U.S.C. § 112, 2nd paragraph, should be REVERSED.

Ground (C)

Claim 8 stands objected to because of improper Markush format. That rejection is untenable and should not be sustained.

Claim 8 sets forth proper Markush language in the form of "the hydrosoluble copolymerized monomers are selected from the group consisting of methacrylic acid, ... ammonium dimethyldiallylchloride, and mixtures thereof".

Thus, the objection to Claim 8 should be REVERSED.

CONCLUSION

For the above reasons, it is respectfully requested that all the rejections still pending in the Office Action of February 28, 2008, be REVERSED.

Respectfully submitted,

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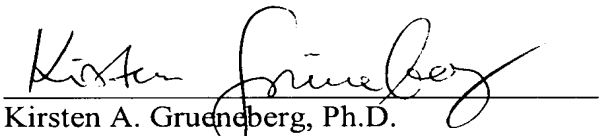
Norman F. Oblon



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VIII. CLAIMS APPENDIX

Claim 1: A process for controlled radical homopolymerization, in an aqueous solution, of acrylic acid and its salts, or of copolymerization, in aqueous solution, of acrylic acid with one or more hydrosoluble monomers, wherein said process is in batch or semi-batch mode, and wherein said process comprises two stages, the first of which is synthesizing "in situ" an hydrosoluble transfer agent used in the second stage of polymerization;

wherein the reactive media of the first stage of synthesis of the transfer agent and of the second stage of polymerization are identical and solely water.

Claim 3: The process according to claim 1, wherein said process is a process of controlled radical homopolymerization, in an aqueous solution, of acrylic acid, and is undertaken in batch mode.

Claim 4: The process according to claim 1, wherein the hydrosoluble transfer agent is an α-substitute β-carboxylate xanthate salt.

Claim 5: The process according to claim 1, wherein, in the second stage of polymerization, the limits of quantity of transfer agent are determined, such that the molar ratio of transfer agent to monomer is between 0.001% and 20%, and the mass ratio of transfer agent to monomer is between 0.01% and 60%.

Claim 6: The process according to claim 1, wherein said process consists in putting in contact in the first stage:

- a potassium xanthate,

- 2-bromopropionic acid sodium salt,
- water,

and then in adding, in the second stage, acrylic acid and at least one hydrosoluble initiator of free radicals.

Claim 7: The process according to claim 1, wherein the first stage is undertaken with equimolar quantities of potassium xanthate and the sodium salt of 2-bromopropionic acid.

Claim 8: The process according to claim 1, wherein the hydrosoluble copolymerized monomers are selected from the group consisting of methacrylic acid, itaconic acid, maleic acid, 2-acrylamido-2-methyl-1-propane sulphonic acid in acid form or partially neutralized, 2-methacrylamido-2-methyl-1-propane sulphonic acid in acid form or partially neutralized, 3-methacrylamido-2-hydroxy-1-propane sulphonic acid in acid form or partially neutralized, allylsulphonic acid, methallylsulphonic acid, allyloxybenzene sulphonic acid, methallyloxybenzene sulphonic acid, 2-hydroxy-3-(2-propenyloxy)propane sulphonic acid, 2-methyl-2-propene-1-sulphonic acid, ethylene sulphonic acid, propene sulphonic acid, 2-methyl sulphonic acid, styrene sulphonic acid, as well as all their salts, vinyl sulphonic acid, sodium methallylsulfonate, sulfopropyl acrylate or methacrylate, sulfomethylacrylamide, sulfomethylmethacrylamide, acrylamide, methylacrylamide, n-methylolacrylamide, n-acryloylmorpholine, ethylene glycol methacrylate, ethylene glycol acrylate, propylene glycol methacrylate, propylene glycol acrylate, propene phosphonic acid, ethylene or propylene glycol acrylate or methacrylate phosphate, vinylpyrrolidone, methacrylamido propyl trimethyl ammonium chloride or sulphate, trimethyl ammonium ethyl chloride or sulphate methacrylate, as well as their acrylate or acrylamide counterparts, whether quaternised or not, ammonium dimethyldiallylchloride, and mixtures thereof.

IX. EVIDENCE APPENDIX

None.

X. RELATED PROCEEDINGS APPENDIX

None.